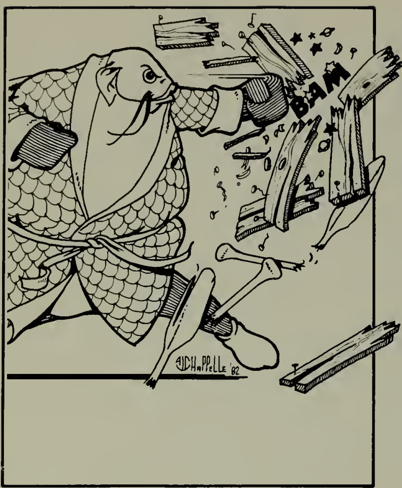
Ontario fish and wildlife Review

Vol. 19, No. 4

Ontario



Did you know Ontario had North America's first government fish hatchery? "Restocking our waters" describes how it all began and what today's fisheries managers are up to. Fish enthusiasts can also marvel along with Charlie Weir at the antics of the incomparable carp.

If you'd rather hunt, Mike Buss can tell you where to learn to do it safely.

Conservation is both a matter of global strategy (see page 2) and a matter of countless localized projects and activities. Kerry Coleman sketches Lindsay's osprey management program, Dave Fraser looks into herbicides, and Carl Monk tells of a poacher foiled by some stubborn conservation officers.

Front cover—A Saugeen River angler with rainbow trout. Photo by Jim Atkinson.

Outside back cover—Osprey in nest. Photo by Barry Ranford.

Inside back cover—Rainbow stocking in Lake Ontario about 1878. Reprinted from the Conservationist (New York State).

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The goal of the Ministry of Natural Resources is to provide opportunities for outdoor recreation and resource development for the continuous social and economic benefit of the people of Ontario, and to administer, protect and conserve public lands and waters.

Ontario
Ministry of Natural Resources
Hon. Alan W. Pope
Minister
W. T. Foster
Deputy Minister

EDITORIAL

In 1980, the much acclaimed but largely unpublicized World Conservation Strategy[1] was introduced by the International Union for Conservation of Nature and Natural Resources (IUCN). This is an organization of more than 450 governments and non-government agencies.

The magnitude of the task of putting such a strategy on paper was mind-boggling. In spite of this challenge, five years of hard work by more than 700 writers and reviewers have resulted in an important publication. Canada can be proud of the contribution of Dr. David Munroe, former head of the Canadian Wildlife Service, who led the way as Director-General of the IUCN at the time of the Strategy's inception and writing.

The document makes fascinating reading. It defines conservation as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations."

The underlying message of the document is that the goals of the conservation and development of natural resources are complementary. Both are directed at achieving the sustainable use of natural resources. This will not happen while conservation is seen as a narrow activity. It involves all sectors of society.

The World Conservation Strategy is written with the broadest perspective in mind—the entire world. But reading it is a must for individuals and groups with specific concerns. This includes naturalists, anglers, hunters, planners, farmers, engineers, and anyone else who is interested in and concerned with conservation. For those who prefer easier reading, a popularized version is available in paperback under the title, *How to Save the World.*[2]

In the interest of publicizing the World Conservation Strategy more widely, we are presenting a summary in this issue.

[1] *World Conservation Strategy: International Union for Conservation of Nature and Natural Resources, 1980. 1196 Gland, Switzerland.*

[2] *How to Save the World, 150 pp., 1980. Unipub. New York, N.Y.*

World Conservation Strategy
Executive Summary

The World Conservation Strategy is intended to stimulate a more focussed approach to the management of living resources and to provide policy guidance on how this can be carried out by three main groups:
— *government policy makers and their advisers;*
— *conservationists and others directly concerned with living resources;*
— *development practitioners, including development agencies, industry and commerce, and trade unions.*

1. *The aim of the World Conservation Strategy is to achieve the three main objectives of living resource conservation:*
a. **to maintain essential ecological processes and life-support systems** (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend;
b. **to preserve genetic diversity** (the range of genetic material found in the world's organisms), on which depend the functioning of many of the above processes and life-support systems, the breeding programmes necessary for the protection and improvement of cultivated plants, domesticated animals and microorganisms, as well as much scientific and medical advance, technical innovation, and the security of the many industries that use living resources;
c. **to ensure the sustainable utilization of species and ecosystems** (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries.

2. *These objectives must be achieved as a matter of urgency because:*
a. **the planet's capacity to support people is being irreversibly reduced in both developing and developed countries:**
— thousands of millions of tonnes of soil are lost every year as a result of deforestation and poor land management;
— at least 3,000 km² of prime farmland disappear every year under buildings and roads in developed countries alone;
b. **hundreds of millions of rural people in developing countries, including 500 million malnourished and 800 million destitute, are compelled to destroy the resources necessary to free them from starvation and poverty:**
— in widening swaths around their villages the rural poor strip the land of trees and shrubs for fuel so that now many communities do not have enough wood to cook food or keep warm;
— the rural poor are also obliged to burn every year 400 million tonnes of dung and crop residues badly needed to regenerate soils;
c. **the energy, financial and other costs of providing goods and services are growing:**
— throughout the world, but especially in developing countries, siltation cuts the lifetimes of reservoirs supplying water and hydroelectricity, often by as much as half;

One of the many problems we must solve. Photo by Erika Thimm.

— floods devastate settlements and crops (in India the annual cost of floods ranges from $140 million to $750 million);

d. **the resource base of major industries is shrinking:**

— tropical forests are contracting so rapidly that by the end of this century the remaining area of unlogged productive forest will have been halved;

— the coastal support systems of many fisheries are being destroyed or polluted (in the U.S.A. the annual cost of the resulting losses is estimated at $86 million).

3. *The main obstacles to achieving conservation are:*

a. **the belief that living resource conservation is a limited sector,** rather than a process that cuts across and must be considered by all sectors;

b. **the consequent failure to integrate conservation with development;**

c. **a development process that is often inflexible and needlessly destructive,** due to inadequacies in environmental planning, a lack of rational use allocation and undue emphasis on narrow short term interests rather than broader longer term ones;

d. **the lack of a capacity to conserve,** due to inadequate legislation and lack of enforcement; poor organization (notably government agencies with insufficient mandates and a lack of coordination); lack of trained personnel; and a lack of basic information on priorities, on the productive and regenerative capacities of living resources, and on the trade-offs between one management option and another;

e. **the lack of support for conservation,** due to a lack of awareness (other than at the most superficial level) of the benefits of conservation and of the responsibility to conserve among those who use or have an impact on living resources, including in many cases governments;

f. **the failure to deliver conservation-based development where it is most needed,** notably the rural areas of developing countries.

4. *The World Conservation Strategy therefore:*

a. **defines living resource conservation and explains its objectives,** its contribution to human survival and development and the main impediments to its achievement (sections 1-4);

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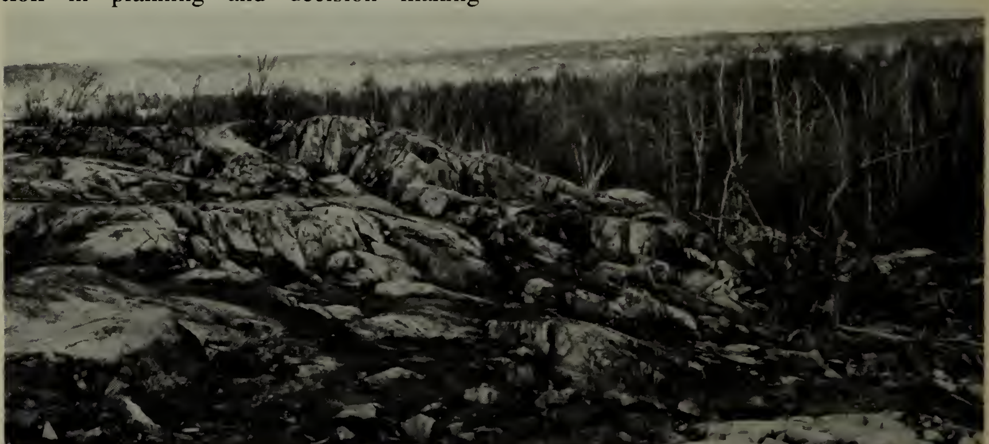
Erosion near farmland on the Credit River. Photo by Erika Thimm.

Continued from page 3
b. **determines the priority requirements for achieving each of the objectives** (sections 5-7);
c. **proposes national and subnational strategies** to meet the priority requirements, describing a framework and principles for those strategies (section 8);
d. **recommends anticipatory environmental policies, a cross-sectoral conservation policy and a broader system of national accounting** in order to integrate conservation with development at the policy making level (section 9);
e. **proposes an integrated method of evaluating land and water resources, supplemented by environmental assessments,** as a means of improving environmental planning; and **outlines a procedure for the rational allocation of land and water uses** (section 10);
f. **recommends reviews of legislation** concerning living resources; **suggests general principles for organization within government;** and in particular **proposes ways of improving the organizational capacities for soil conservation and for the conservation of marine living resources** (section 11);
g. **suggests ways of increasing the number of trained personnel;** and **proposes more management-oriented research and research-oriented management,** so that the most urgently needed basic information is generated more quickly (section 12);
h. **recommends greater public participation** in planning and decision making concerning living resource use; and **proposes environmental education programmes and campaigns** to build support for conservation (section 13);
i. **suggests ways of helping rural communities to conserve** their living resources, as the essential basis of the development they need (section 14).

5. *In addition, the Strategy recommends international action to promote, support and (where necessary) coordinate national action, emphasizing in particular the need for:*
a. **stronger more comprehensive international conservation law,** and **increased development assistance for living resource conservation** (section 15);
b. **international programmes** to promote the action necessary to conserve **tropical forests and drylands** (section 16), to protect areas essential for the preservation of **genetic resources** (section 17), and to conserve the global "commons"—**the open ocean, the atmosphere, and Antarctica** (section 18);
c. **regional strategies** to advance the conservation of **shared living resources** particularly with respect to **international river basins and seas** (section 19).

6. The World Conservation Strategy ends by summarizing **the main requirements for sustainable development,** indicating conservation priorities for the Third Development Decade (section 20). ■



Effects of air pollution on vegetation. Photo by Erika Thimm.

A loose screw can cost $500

by Carl Monk
Law Enforcement Co-ordinator,
MNR, Cochrane

THE now-famous Chapleau Crown Game Preserve was created by Order-in-Council dated May 30, 1925 to safeguard a vanishing array of fine furbearers. Since then, it has been a haven not only for species like beaver, lynx, fisher and marten, but also for birds, moose, timber wolves and other animals. As with game preserves everywhere, it is illegal to hunt or trap within its boundaries. Poachers know this. But it does not always stop them.

On a Sunday in late May of 1980, conservation officers Doug Lynn and Serge Gendron received a tip that a moose had been killed some 15 kilometres inside the preserve. When they reached the site, they found a large, reddish blotch on the sand.

"This is where it fell," said Lynn, "right on the shoulder of the road."

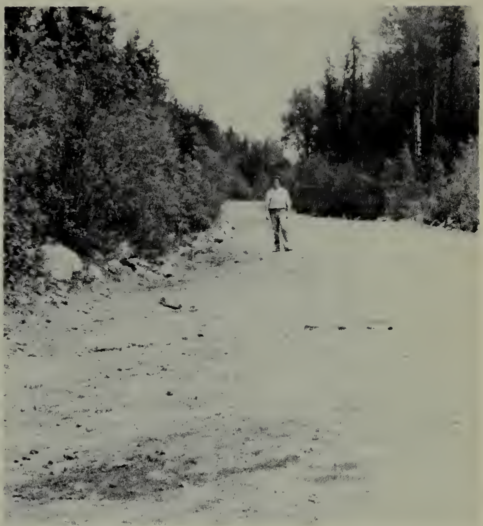
"Must have been at night," said Gendron. "This logging road's well used. Looks like it was killed about two days ago—maybe three. Surely they wouldn't take a chance during daylight. Plenty of moose hairs here. Let's see if we can find where they gutted it."

They found entrails and the head of what looked like a yearling bull partly hidden under a rock and some brush a dozen paces off the road. This is a typical poacher's trick—hide the remains to keep ravens, meatbirds (Canada jays) and people from finding them, and let bacteria and insects devour them. The growing season was well under way, so bracken ferns and flowering shrubs would soon cover things up.

"Let's search the area," said Gendron. "Maybe we'll get lucky."

Tire tracks showed that poachers had backed up a truck to the carcass. Their pattern and depth in the soft sand suggested a four-wheel drive. Gendron took pictures. A thorough search of the site failed to turn up any more clues, so the officers took samples of the reddish sand and the moose hairs and drove back to Chapleau.

There they conferred with enforcement co-ordinator, Tom O'Shaughnessy.



Serge Gendron stands at the kill site in the Chapleau Preserve. Photo by Doug Lynn.

"Not a lot to go on," Lynn admitted. "Those poachers sure did a clean job."

"Looks that way," said O'Shaughnessy. "Maybe you'll dig up something around town."

But the townspeople at the local lumber yard, the railway terminal and a score of other gossipy hangouts were strangely silent about the recent moose killing in the preserve.

The investigation was bogged down.

Five days later, it picked up again. While taking an early-morning walk along the main street of Chapleau, Lynn spotted a new four-wheel-drive Datsun half-ton parked at the curb. The habits of his profession made him glance at the tires. Then he looked again. The depth and pattern of the treads looked like a match for the tracks he had found at the site of the moose kill. He jotted down the licence number.

Within a few hours, Lynn was on the road to the preserve. Deputy conservation officer Grant Gillespie was with him. Upon

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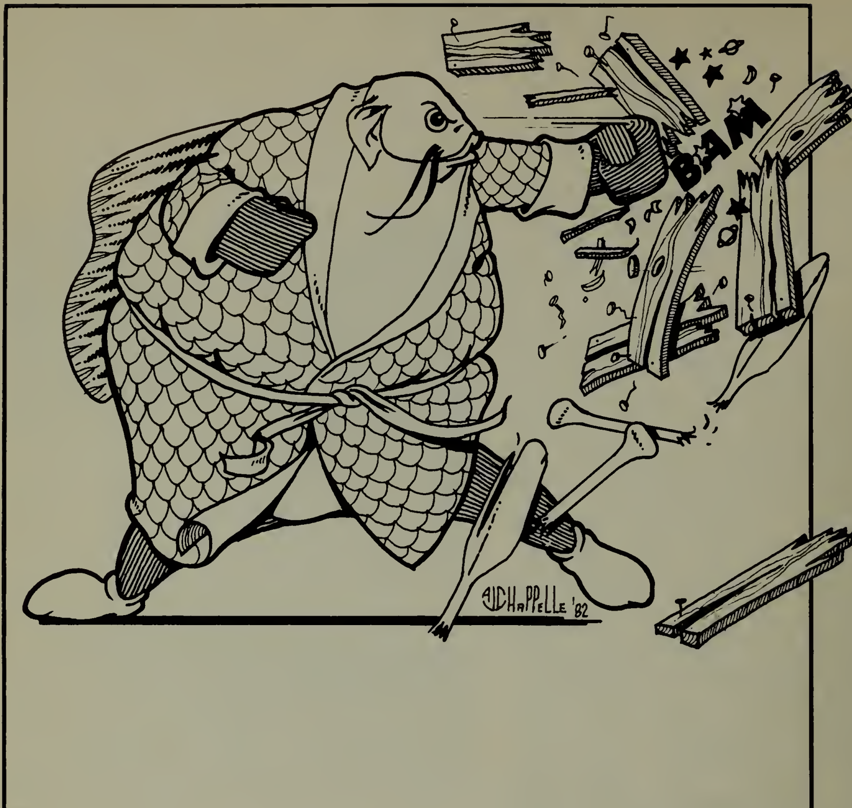

Carp are tough, wary and smart

by Charlie Weir

BACK in the good old days (when I had no responsibility) if any new creature appeared in or on the Pigeon River at Omemee we had to have a sample right away. And so it was with carp back about 1930.

The local sucker run each spring was a highlight of the year. We caught them any way we could, but we had the most fun by snaring them from two bridges, using wire nooses on long poles. We also made some money selling the fish.

Gradually, a few large, heavily scaled, bass-shaped fish began to appear along with the suckers. The single-ply wire in our snares went ''snik'' when we yanked on the big creatures. If we doubled or tripled the strength by twisting the strands, the loops were more evident and we could not get the wary strangers into our snares.

Some of the older ''river rats'' in our group had home-made spears that they threw from the stone-filled log cribs supporting the Back Bridge. Here, almost at water level, they succeeded in driving spears into several of the newcomers, only to have them twist off and escape, badly wounded. Finally, one enterprising chap did manage to spear a fish and pin it to the gravel bottom until it gave up the struggle. It was identified as a carp—a species rapidly invading the Kawarthas.

Most warmwater fish such as pike, muskie and bass will tolerate the presence of a man or a boat in the vicinity if there is no movement and no telltale shadow. Carp seem to be different.

Once, as I was canoeing up a narrow channel in a marsh, I spotted a lone carp coming toward me some 46 metres away. Remaining motionless, I watched with great interest. The carp was not alarmed and continued feeding on the bottom as it slowly progressed toward the canoe. About 18

metres away, it stopped. It turned broadside like a woodchuck for a better look, then stopped and stared at me for a minute or two. Evidently it didn't like what it saw, and it gradually completed its full turn. Without haste or alarm, it headed back up the channel. I would say it showed the instinct and wariness of a mammal when confronted with danger or the unusual, and I had never seen a fish act like that.

It is very difficult to sneak up on carp by boat. There may be a whole school of them making a great commotion while feeding in a shallow, weedy bay, but they are ever on the alert for danger. However, they are at a disadvantage when they tip like a duck feeding on the bottom—head down, tail up. A quick stroke of the paddle will often put a canoeist right on top of them, and it is possible to slug them. I tried it once and managed to splinter a good paddle.

Carp have another habit they must have learned at "evasive action school." When caught out in the open in a shallow, weedless bay, they will dart away at full speed, thumping the muddy bottom repeatedly to create a kind of smoke screen. If several carp have been disturbed, the entire bay will be roiled up in short order.

These big fish are usually found in schools. They may be scattered throughout the vegetation in a bay when feeding, or tightly bunched like a squad of soldiers when travelling or when a group decision has to be made. If confronted by a dark bridge, an impounding net or a narrow channel, they will mill about for hours until one fish finally darts through. Then they all follow like sheep.

When harvested for commercial purposes, carp are usually kept in retainers or live-boxes and then shipped live to the market in tanker trucks. Wild carp will never peaceably accept confinement of this or any other kind. They continually try to escape and will take advantage of any weakness in the enclosure.

One live-box, made of wooden slats 2.5 centimetres by 15 centimetres and resembling a large wooden crate, was weighted with boulders and rested on the bottom near shore. It was full of carp. It had not been inspected regularly and the end of one slat was a bit loose on the corner post. The carp found this weakness and kept pushing on it with their noses until the board could be sprung out at one end. By morning, about half the carp in the live-box had escaped, one at a time.

Carp in a pound net will try to escape by jumping or by pushing singly or as a group. A pound net has a square, open-topped retainer that is held erect in the water by four corner stakes driven into the soft bottom. It hangs like a large bag with about one metre of its top above water.

In one instance, the carp loosened the stakes on one side of a pound net by persistent pushing, slackening the upright wall of the retainer. During the next big onslaught, the top of the wall sagged to within 15 centimetres of the water and each carp escaped with a little jump and a flip of its tail.

Carp are difficult to handle in a dip net. Their formidable saw-toothed dorsal spines invariably become entangled in the netting. In one case, a carp jumping desperately to escape from a pound net got its dorsal spine entangled in the mesh, leaving it hanging about 60 centimetres above the water. Still struggling, it flipped its body again and went over the side to freedom.

When in serious trouble, carp become desperate. They seem to sense the lowering of water in a pool and generally manage to get out in time. But people can trap them by suddenly cutting off the water flow from a dam. Trapped in the pool below and chased by men with dip-nets, carp try to escape by jamming themselves between the boulders as far as they can. It takes a strong pull by the tail to get them out. If not removed they would die a lingering death.

People seem to have a certain disdain for carp. One irate citizen gave a dead carp lying on the dock a good kick. Unfortunately the carp's dorsal spine went right through his rubber boot—and into his big toe! Even in death, carp command respect.

The books tell us that carp have the best-developed brain and the most blood of any fish. I have no quarrel with such statements.

A final word about carp. For goodness sake don't bury them in your flower garden as fertilizer. They will be dug up by skunks and will then attract coons, dogs, cats, gulls and crows. ■

Learning by trail and error

Report and Photos by M. E. Buss
Biology Specialist, The Leslie M. Frost Natural Resources Centre

IN 1981 a long-needed training trail for new hunters was introduced by the Ministry of Natural Resources at The Leslie M. Frost Natural Resources Centre near Dorset, Ontario.

The first of its kind in Ontario, the trail is now open to anyone—youngsters and adults—interested in learning about hunting. The staff of the Frost Centre supervises the trail and the training course. Appointments must be made in advance through the Centre.

More than 100 young people, most of whom were associated with the Ontario Federation of Anglers and Hunters Junior Conservation School, have taken part in this new program. Their enthusiasm was kindled by the realistic setting and the competition within the groups.

The trail has 17 stations that simulate actual hunting conditions. Each has been chosen to demonstrate or test for the skills and knowledge required by today's hunters. All participants are taught the basic rules of firearms safety, as well as the rudiments of natural history and the objectives of wildlife management.

Each trail walk is conducted by an instructor, who accompanies three or four students. Two or more group members carry unloaded rifles or shotguns so their instructors can assess how they handle them as they cross a fence, walk narrow trails with their companions, and cross a small log bridge.

Decoys test the students' ability to identify species of waterfowl, a skill needed to understand and apply waterfowl hunting regulations. Life-size silhouettes of flying waterfowl test their ability to identify birds on the wing. Silhouettes of game such as moose, snowshoe hare, deer and ruffed grouse are set up in a variety of shooting conditions. Silhouettes of other objects appear in shadow. This tests whether the students are alert and shows them how they could jeopardize a human life by carelessness.

The students must make decisions about wildlife species, the licences needed to hunt each one, the type of firearm required, the safety of taking the shot and the range of the target.

Student hunters learn to cross a fence safely. Photo by B. Martin.

A private property sign at one location sparks a discussion of the hunter's responsibility for obtaining permission to enter private lands. This is an important topic because Ontario has new trespass laws.

A trap is set at one station to stimulate a discussion about trapping and the implication of trapping on private land.

To improve the hunters' knowledge of a particular species, the trail can be adapted to a specific game animal. Dr. Tony Bubenick, who recently retired from his post as big game behaviorist for the ministry's Wildlife Research Section, suggested using a similar course to teach hunters to identify the moose's sex, age and position within the social hierarchy. The trail could be set up with moose whose antlers and hair color reflect these characteristics.

The hunters and other recreationists of the future will need more skills, and training trails like the one at the Frost Centre will play an important role in developing them. ■

Working together for ospreys

by Kerry Coleman
Biologist, Lindsay District

THE two ospreys swooped and swerved overhead, emitting piercing warning calls to the flightless young in the nest and to the human intruders. This was hardly a fitting reception; after all, we had provided them with their new home. But we were not offended because the nesting platform we had constructed was a success. There was the proof—two young birds staring at us from the nest.

Constructing nesting platforms is just one part of the osprey management program run by Lindsay District of the Ministry of Natural Resources.

The osprey is a magnificent, hawk-like bird that feeds almost exclusively on fish, primarily coarse fish such as suckers. In the 1960s and early 1970s, osprey numbers declined to very low levels in many parts of North America. This has been attributed to the extensive use of DDT in some areas. Residues of the pesticide caused eggshell thinning, which drastically reduced hatching success.

DDT was first used in North America in the mid-1940s and was banned in the early 1970s. Since its prohibition, osprey numbers in many areas appear to be increasing.

The Lindsay District includes most of the Kawartha Lakes and the many creeks and marshes associated with them. These shallow and highly productive waterbodies appear to be ideal habitat for ospreys.

Ministry staff, several agencies and the public have participated in the osprey management program, which began in 1978 with a detailed osprey nesting inventory. The object was to check and describe all reported osprey nests in the district and to determine how ospreys should be managed.

The inventory revealed two problems.

First, many of the ospreys in the northwestern part of the district have become stump nesters. This is due to an apparent shortage of the tall trees in which they nest. The primary threat to stump nests is people, especially near busy navigation channels. These nests are also exposed to fluctuating water levels, wave action and predators. If the nests are repeatedly disturbed the adults will eventually abandon their young.

The second problem is that ospreys nest on the tops of hydro poles, and the nests are often blown down. This could present a hazard to people or disrupt power transmission.

When another osprey inventory was conducted during the spring and summer of 1979, a pair of ospreys was discovered nesting on a hydro pole at Pigeon Lake. That fall, ministry and Ontario Hydro staff erected a large dummy hydro pole with a nesting platform. Ospreys used the dummy pole and successfully raised two young.

In the winter of 1979 at Stoney Lake, staff from Ontario Hydro and two timber technicians from Lindsay transferred an osprey nest from a hydro pole to the top of a nearby white pine.

That same winter, conservation officers constructed three artificial nesting platforms for osprey and erected them near stump nests that were prone to human disturbance. The platforms were placed away from busy channels.

There were 18 active osprey nests in 1978, 20 in 1979 and 23 in 1980, according to nesting surveys. Only 17 of the nests that were active in 1979 were active again in 1980. The remainder were either destroyed or abandoned.

The higher nest count each year may reflect an increasing population or more intensive survey efforts. Because ospreys are regularly observed where there are no known nests, we suspect that some active nests have not been located.

In 1981, conservation officers erected two additional nesting platforms to replace unsuccessful stump nests or nests prone to disturbance. Eventually, we hope to erect platforms in locations where ospreys have not recently nested but where the habitat is suitable.

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Osprey stump nest. Photo by Dean Rivett.


Osprey nest on hydro lines—a
Photo by Dr. Donald Gunn.


A man-made osprey high-rise. Photo by Dr. George Peck.

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A nesting pair at home. Photo

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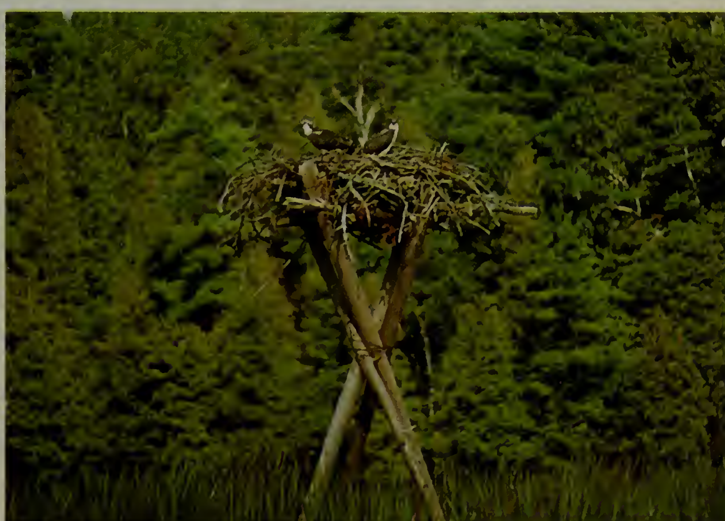
Donald Gunn.

Building a better nesting alternative. Photo by Kerry Coleman.



Young birds on a man-made platform. Photo by Dean Rivett.

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So far, eight artificial nesting structures have been erected. The Ministry has constructed five platforms, and two nests have been removed from hydro poles and relocated. In addition, a pair of ospreys have successfully used a platform built by some interested cottagers on top of a television antenna tower.

There has been tremendous interest in the Lindsay osprey program. Members of the public are credited with finding many of the new nests. People living close to an osprey nest often assume a stewardship over it, keeping the Ministry informed of nesting success and reporting any disturbances.

It appears that the osprey population is responding to our management program. This encourages us to feel confident about the future of this magnificent bird. ■

A LOOSE SCREW . . .

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arrival, Lynn took several pictures of the whole kill site, and of the tire tracks. Then he began to position his camera for a close-up of the tracks.

Through the lens, he saw a flash of light.

Kneeling for a closer look, he found a self-tapping, bluish-grey screw. It could have come from a vehicle, and it looked new. A washer was still attached to it.

"If we can find the hole this fits," he said to Gillespie as he wrapped and pocketed the clue, "we may be able to connect somebody to the kill after all."

Lynn called Chapleau's Constable J. P. Brais of the Ontario Provincial Police to find out who owned the Datsun he had seen that morning. It was a man who was known to have poached game before. From other bits and pieces of information, Lynn was able to place the man on the road near the kill site within the time frame established for the poaching. He consulted with O'Shaughnessy, and they decided they had enough evidence to ask for a search warrant.

When O'Shaughnessy, Gillespie, Brais and Lynn searched the suspect's home, they found no trace of moose meat. But in the box of the Datsun half-ton, Lynn discovered a half dozen moose hairs and several grains of reddish sand. On the underside of the driver's door he found another moose hair. A red and black jack shirt lying on the truck's front seat had one more moose hair stuck to it. Lynn put the hairs and sand in separate plastic bags and labelled them.

Then he looked at the truck's fenders. From under the right front fender a single screw was missing. Lynn tried the one he had found in the preserve. It fit—same size, color and thread. Now he had no doubt that this truck had been at the kill site. With the owner's permission, he took a screw from the right rear fender for comparison, and photographed the front and rear tires.

Lynn gave the hair and sand samples to Dr. Norman Fish of the University of Guelph, asking him to determine whether the hairs found on the Datsun were from a summer or winter coat. Then he sent the two metal screws to the Centre of Forensic Sciences in Toronto for scientific comparison.

About a month later, Lynn heard from the centre. The news was discouraging. No definite conclusion could be drawn about the two screws. But the news that followed from Dr. Fish was brighter. The moose hairs from the truck were from a summer coat. This might prove that the owner had taken a moose out of season.

When Lynn consulted Assistant Attorney Helen Chartrand in Sudbury a few days later, he was told he had "a pretty good circumstantial case." So on September 20, he swore an information (a legal document accusing someone of violating the law), charging that the Datsun's owner "on or about May 30, 1980, did knowingly possess game hunted in contravention of The Game and Fish Act."

Making a charge like this with only a few hairs as evidence might seem a little presumptuous. But the Act is explicit. Section 1 (11) states, "'game' means a game animal. . .and includes any part of such animal."

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How deer habitat would look two years after spraying. Staff photo.

Habitat and herbicides

by D. G. Fraser

IN one version of the King Arthur stories, whenever the evil fairies hit upon a particularly malicious plan, they would all chant, "Good, good, very good!" But the echo would go up the valley, "Bad, bad, very bad!"

A moose listening to a group of forest managers discuss a particularly "good" plan to treat a forest area with herbicides might be inclined to make the same kind of reversed judgement. I think that many forest animals are entitled to view the use of herbicides in forestry as a pernicious plot to suppress desirable deciduous species and encourage bristly, foul-tasting conifers.

To moose, deer, and many other wildlife species, deciduous shrubs and young deciduous trees are tasty, nutritious, and generally the most desirable in the forest. But the conifers—spruce and pine in particular—are of little value to them, especially when growing in solid, even-aged stands.

There are, of course, some important exceptions to this contempt for conifers. White-tailed deer make considerable use of cedar and hemlock for food and winter cover; moose browse heavily on balsam fir in some areas, and use young fir trees as wind-breaks at bedding sites.

Many American wildlife biologists have made substantial use of herbicides to improve wildlife habitat. In fact, when 2,4-D was first developed, many saw it as a major tool for habitat improvement. In Minnesota, for example, 2,4-D was used to kill the tops of mountain maples that had grown out of reach of deer. This method stimulates new growth and produces more browse. In aspen and mixed wood forests in Michigan, a pellet-type herbicide made from picloram and 2,4-D is used to maintain clearings for deer and grouse. Only slightly toxic to mammals, fish and birds, this herbicide kills aspen, balsam poplar, birch, alder, maple, spruce and jack pine when applied at the rate of 16.8 to 22.4 kilograms per hectare.

Part of Alaska's Kenai Peninsula has been designated a National Moose Range. There, giant tree-crushing machines are

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used to knock down mature forests to improve living conditions for moose.

Both these management techniques tend to be used only where wildlife is valued highly. Where people place a lower priority on forest wildlife one is not likely to see the use of herbicides, much less tree-crushers, for the improvement of wildlife habitat.

The introduction of potentially toxic herbicides into the wildlife environment has caused concern. In the case of large ruminants, there does not seem to be much cause for alarm. In one instance, some cattle and sheep were thought to have been poisoned when their pastures were sprayed with a herbicide. But this poisoning resulted from a change in the nitrogen cycle in the soil and vegetation, rather than from the herbicide directly. In experimental cases, the ingestion of herbicides by mammals led to the death or malformation of foetuses. But these harmful effects occur only when large quantities are eaten. The consensus seems to be that normal amounts are unlikely to endanger the health and reproductive success of large game animals.

When forest or range managers use herbicides to produce a desired change in the vegetation, animal populations may be affected. The suppression of herbs and shrubs with herbicides has sometimes reduced the abundance and diversity of animal life.

A few studies have shown how these detrimental effects can be prevented. For example, the spraying of a large block of Texas rangeland with 2,4,5-T and picloram was followed by a reduction in the numbers of white-tailed deer. On an adjoining site, no reduction was seen when 20 per cent of the area was left as unsprayed strips.

The principle of leaving unsprayed strips or patches for wildlife is probably a good one, but it is not directly applicable to Ontario habitat. Where there has been a clear cut, moose browsing is light in the middle of the cut area but heavier around the edges. Therefore, spraying the middle and leaving a strip around the edges could do more to increase an area's value as moose habitat than would spraying the entire thing.

The components of forest ecosystems are inter-related in ways that are often poorly understood. The use of chemicals, like all management activities, can influence an ecosystem in unforeseen but fundamental ways that have ramifications for all aspects of forest life.

These complex inter-relationships are exemplified by an Oregon study of the feeding habits of forest rodents. The study indicates that certain types of rodents are particularly fond of eating the mycorrhizal fungi that live in association with the roots of trees. It appears that these fungi have no way of spreading their own spores, and their dissemination depends on their being eaten and transported by rodents.

Because small rodents eat the seeds of trees, foresters have traditionally regarded them as enemies of tree regeneration. However, the Oregon study suggests that, in a burned area, for example, the successful regeneration of trees—and all the subsequent benefits to forestry and wildlife—may depend on the reintroduction of the mycorrhizal fungi by rodents.

A second example of the inter-relationships among forest ecosystems comes from the study of northern hardwood forest ecology done at the Hubbard Brook Experimental Forest in New Hampshire. As part of an experiment, the forest vegetation in one watershed was cut and then treated with a herbicide.

The results included a disruption of the nitrogen cycle and a massive leaching of nutrients. The stream water flowing out of the watershed contained 16 times more potassium than previously. The nitrate levels exceeded health standards for human consumption and the water even developed an algae bloom. In summing up this study, the authors warned against naive management practices which can produce unexpected and unfortunate results.

These two research studies show that we should try to gain a better understanding of all the workings of the ecosystem, not just the effect of herbicides. In Ontario and many other provinces and states, we have not devoted enough effort to managing the different components of the forest ecosystem in an integrated fashion. But in Ontario this is now changing. The province is working toward the management of the forest ecology as a whole. ■

Stocking a North Bay lake with brook trout in 1955. Photo by R. Muckleston.

Restocking our waters

by Fisheries Branch staff

IN the 18th century when the first Europeans began settling in southern Ontario, the lakes and streams had an abundance and variety of fish.

As more settlers poured in and forests were cleared, mill dams constructed and wetlands drained, a series of ecological changes began. Stream banks eroded when the brush and trees that anchored the soil were cleared. Silt ran into streams and covered the clean gravel of spawning beds, suffocating the young fish and eggs. So did the sawdust from hundreds of small, streamside mills. Soon people began to notice that there were fewer fish.

In the early days one of the most beautiful and plentiful fish was the Atlantic salmon (*Salmo salar*). Every fall, Lake Ontario's tributaries surged with them.

Their numbers had visibly declined by the beginning of the 19th century. The resulting public pressure forced the government of 1897 to establish the first fishing restrictions in Upper Canada. In that year they prohibited the taking of salmon or salmon fry "by setting any net or nets, weirs . . . in any river or creek." It was not until 1865 that spearing was prohibited.

Samuel Wilmot, a well-to-do farmer and later superintendent of fish culture for Canada, had lived most of his life on a farm beside Wilmot Creek. Every fall thousands of shimmering Atlantic salmon fought their way upstream toward the spawning grounds while Wilmot watched and learned.

Wilmot was seriously concerned about the decline of the salmon and wondered what could be done to ensure their survival. He turned not to the government but to his own resources. Why not capture the fish, take the salmon spawn by hand, hatch the eggs and rear the young in captivity? Samuel Wilmot's farmhouse cellar soon became Ontario's first fish hatchery.

Wilmot developed techniques for producing salmon that met with significant success. A government increasingly under pressure to save the salmon was looking for just such an approach.

In 1868, the first government hatchery in North America was opened on Wilmot Creek near Newcastle. Samuel Wilmot was

appointed manager. Before long the hatchery was producing more than one million fish every year. Similar facilities using Wilmot's techniques began to spring up throughout eastern Canada and the United States.

Each year more than a million fish were released into the rivers flowing into Lake Ontario. It looked like a solution, and increases in Lake Ontario's Atlantic salmon during the following decade fostered the belief that hatchery-reared fish would restore the salmon to their earlier abundance.

But after 1879, decreases in the salmon runs became apparent. Then, within only a handful of years, the fish disappeared. The Newcastle hatchery closed down. As would later be understood, the fish could not survive the drastic changes to their habitat.

The failure of the salmon stocking program might have spelled the end of fish culture in Ontario. But early fisheries managers were not easily discouraged. They began raising other species. Visions of waters swarming with fish continued to inspire them.

The results of their sustained efforts were increasingly dispiriting. Soon a decline in native lake trout (*Salvelinus namaycush*) and brook trout (*Salvelinus fontinalis*) in southern Ontario waters was noticed. Anglers turned to other native species, and some demanded the culture and stocking of imported varieties that they had enjoyed elsewhere. Little thought was given to the biological implications of planting foreign species.

Many introductions failed. A few, like the rainbow trout *(Salmo gairdneri)* from western North America and the brown trout *(Salmo trutta)* from Europe, were successful. These two species now provide a substantial sport fishery for Ontario residents.

Notwithstanding failures, a strong emphasis on fish culture continued through the first half of the 20th century. Initially, Ontario's hatcheries were constructed only by the federal government. By 1926, the province had taken them over. It was soon operating 29 stations for the production of both commercial and game fish.

Early fisheries management consisted mainly of enforcing regulations and stocking hatchery fish. In the 1940s, fisheries managers began to investigate the results of hatchery plantings and reached the following conclusions.

First, the stocking of eggs, fry or fingerlings in waters in which the species stocked was already reproducing naturally tended to fail; the young stock usually died. But the stocking of older fish was more successful.

Second, fish should be stocked only in waters with suitable environmental conditions.

A new system of fish culture was developed, based on these conclusions.

The Ministry of Natural Resources now operates 14 fish culture stations to meet the province's requirements for hatchery-reared fish. To meet the stocking demands for the inland waters and the Great Lakes, the fish culture stations at Dorion and Hills Lake were recently expanded and upgraded. Similar work is planned for the stations at North Bay and Sault Ste. Marie.

Twelve fish species are now reared at the provincial hatcheries. Ontario's fish culture program has centred on lake trout, brook trout, splake (a hybrid of brook and lake trout), brown trout and rainbow trout. Coho salmon *(Oncorhynchus kisutch)* and chinook salmon *(Oncorhynchus tshawytscha)* are also reared and provide a substantial sport fishery in western Lake Ontario.

Smallmouth bass *(Micropterus dolomieui)* largemouth bass *(Micropterus salmoids)* muskellunge *(Esox masquinongy)* and walleye or yellow pickerel *(Stizostedion vitreum vitrium)*, all native, non-salmonid species, are cultured on a limited basis. This is because past introductions of these species met with little success for reasons still under investigation. Future plantings of these species will probably be limited to fish rehabilitation and research programs.

THE SELECTION OF WATERS

Because hatchery facilities permit the production of only so many fish, and because stocking is costly, the waters to be stocked must be carefully selected. The selection process is complex and is based on the need for stocking, the suitability of the water, the type of fish required, and the overall feasibility of stocking.

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Outside raceways at Dorion Fish Culture Station. Photo by Erika Thimm.

Rearing troughs inside Chatsworth Fish Culture Station. Photo by T. Jenkins.

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Need for stocking

The need for stocking is determined by public demand, the natural supply of fish, and public access to the water. Anglers must have ready access by public thoroughfare to the waterbody chosen and must not infringe on private property rights.

Suitability of waters

The amount of oxygen in a lake is crucial, especially at certain times of the year. For instance, small inland lakes may be low in oxygen in the winter and thus unsuitable for brook trout. In the summer, the deep, cold areas of Lake Simcoe, where lake trout seek refuge, have low levels of oxygen because of pollution. The future existence of lake trout in this popular lake is threatened.

Water temperature is important as well. Numerous small lakes may appear ideal for trout, but in mid-summer water temperatures could rise to levels that would kill them. In the cool waters of springtime, rainbow trout have often been stocked by landowners in shallow man-made ponds, only to die in the summer when the waters became too warm.

If the purpose of the stocking program is to establish a reproducing population, then it is important that good spawning grounds be available. Gravel beds in some brook trout streams may be covered with silt or mud, preventing the trout from covering their eggs. In some lake trout lakes, the trouts' spawning shoals may be so badly silted that the trout can no longer lay their eggs between the boulders. This is happening in Lake Simcoe.

Physical obstructions or diversions can ruin the prospects of a stocking project. Dams on rivers can block any fish species from reaching spawning beds. For decades, many of the upper reaches of the Nottawasaga River and some of its tributaries were unavailable to migrating rainbow until fish ladders were built at certain dams in the 1960s and early 1970s. Even low beaver dams may prevent brook trout from reaching gravel beds.

To some fish, a lake's size and depth are significant. Brook trout prefer lakes with a surface area of less than 40 hectares because these waterbodies are more likely to have suitable food and the proper springs for spawning. On the other hand, lake trout need large, deep lakes where they can feed on schools of small fish and seek out cold waters in the summer.

Other characteristics of the waters also affect fish populations. Food production in lakes can be high or low depending on the level of nutrients or total dissolved solids (TDS). The TDS of many lakes is now on record. Where no readings have been taken, the TDS should be determined before the stocking of any waterbody is considered. A low TDS reading indicates an infertile lake with little food for fish.

The acidity of our waters has received a great deal of publicity because of the acid rain problem. High acid levels can be lethal to fish eggs and young fry. Why stock acidic waters if reproduction is impossible? Since natural reproduction is the goal, the acidity of a waterbody must also be determined before stocking begins.

Type of fish required

Finally, the fish's adaptations must be considered before stocking commences. The numerous strains or races of each species have unique genetic characteristics. Anglers familiar with rivers like the Ganaraska and the Sydenham, which harbor both fall-running and spring-running strains of rainbow trout, are well aware of such variations.

There are also lesser known examples of these adaptations. In Lake Superior, lake trout have adapted to spawning on shallow shoals. Lake trout are primarily fish-eaters, but what most people probably do not realize is that lake trout in some lakes have even adapted to a diet of plankton.

Feasibility of stocking

Special attention must be paid to the time of year chosen for stocking and the number to be stocked—facts private pond owners or those with small lakes should keep in mind. Rainbow trout or brook trout should never be stocked in a pond or small lake in the middle of the summer during a hot spell because the high temperature of the water

might kill them. And overstocking a species in a pond or lake that has a limited food supply will result in stunted fish.

When these factors have been considered, there is still the matter of stocking logistics. Where are the fish being reared? How far must they be transported? What method of transport is best? For example, rainbow or brook trout will die in as little as three hours if the water in which they are being shipped is not kept cool.

Disease can be devastating to fish in the crowded confines of a hatchery. Splake infected with furunculosis, a common bacterial disease that causes lesions on the body, have a low survival rate. To all fish species in hatcheries, bacterial kidney disease is virulent. Some viruses can wipe out the entire stock of a large hatchery in a matter of days.

REHABILITATION STOCKING

The main strategy in fisheries policy is to protect and propagate wild, naturally reproducing fish stocks. Stocking needed to build up dwindling fish populations or to reintroduce fish is called "rehabilitation stocking." It must go hand in hand with habitat improvement techniques such as creating new spawning beds and cleaning up old ones.

The ongoing restoration of lake trout to the Great Lakes is a good example of rehabilitation stocking.

The problem began when parasitic sea lamprey *(Petromyzon marinus)* invaded the upper Great Lakes. Within a few decades, while scientists on both sides of the border searched for a solution, the lamprey wiped out the lake trout in Lakes Huron and Michigan. Fortunately, an effective chemical control was discovered in time to save a sizeable portion of the native trout in Lake Superior.

Now, while our federal government works to control the sea lamprey on the Canadian side of the Great Lakes, Ontario is going ahead with the stocking of lake trout in every lake except Lake Erie. Lake Superior receives most of the fish.

Bringing lake trout back to the Great Lakes is a mammoth task, but it promises to be successful.

There are numerous, more modest rehabilitation projects now under way.

For example, the annual stocking of lake trout in Lake Simcoe has maintained angler catches despite the poor reproduction of the native stock, whose spawning beds have been ruined by silt. Here, as in the Great Lakes, efforts are being made to clean up the habitat. For example, water quality is being improved by upgrading sewage disposal facilities.

The stocking of rainbow trout in the Credit River, which is new to this species, should eventually produce large runs of self-reproducing rainbows in a river ideally suited to them.

A well-known example of rehabilitation stocking is the splake planting project in Georgian Bay near Owen Sound, which began in the late 1960s. Because the splake planted during the first few years tended to die before spawning, the Ministry decided to increase the proportion of lake trout genes in the hybrid. This increased the longevity of the splake, which was given the new name, "lake trout backcross." It is too early to tell whether these fish will reproduce in large numbers but anglers are happy with the size of their catches—some fish weigh up to 4.5 kilograms.

PUT-AND-TAKE STOCKING

In some parts of Ontario, the supply of fish has been severely depleted and cannot meet anglers' demands because little or no natural reproduction takes place. In such waters put-and-take stocking occurs. This does not help fish populations to replenish themselves naturally, but it does make for better fishing.

Ontario's 12 Provincial Fishing Areas all receive put-and-take stock. Pine River Fishing Area north of Orangeville, St. Williams Fishing Area, and Cornwall Recreation Area are three sites periodically stocked with large rainbow or brook trout. Some small lakes within the Canadian Shield, where few spawning beds exist, are also stocked with large brook trout on a put-and-take basis.

The ministry's most publicized put-and-take stocking program, begun in 1969, is bringing Pacific salmon to anglers on Lake Ontario. Because the salmon have not yet adapted to a lifetime in fresh water, there is little successful reproduction. Thus the sport fishery must be maintained annually by

hatchery stock. Although this is very expensive, the results are worth the effort. Each spring, coho smolts and chinook fry are released into the streams that flow into the western basin of the lake. And each fall, as the full-grown fish make their return to the stocking streams to spawn, excited anglers reel in trophy-sized salmon. Some of the catches weigh more than nine kilograms.

The province's fish culture program has changed dramatically since its beginnings in Samuel Wilmot's cellar more than 100 years ago. Yet, it is still an emerging science. Researchers and fisheries managers are constantly applying new knowledge from the fields of genetics, fish health, nutrition, biochemistry and engineering to improve the products of our hatcheries.

However, fish stocking is not the panacea it was once thought to be. We have learned that stocking can be successful only when it is integrated with all the other techniques used by fisheries managers. The Ministry of Natural Resources is using modern fisheries management principles to plan for the future of our sport fisheries. ■

A LOOSE SCREW . . .

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The trial was held in Chapleau on December 5. Judge Michel of Sudbury read the charge and Crown Attorney J. H. Sauve set about proving it.

Lynn testified to having found the fresh remains of a young bull moose in the Chapleau Crown Game Preserve, where hunting is prohibited, on May 25, 1980, when the moose season was closed. Constable Brais corroborated Lynn's testimony, and the rest of the evidence was presented.

When Dr. Fish took the stand, he confirmed that the hair taken from under the door of the defendant's Datsun was moose hair. At five centimetres long, it was characteristic of a summer coat. What is more, it closely resembled the hairs from the kill site, which Lynn had given him to analyse.

"Now," said Sauve, "there's been cross examination of Officer Lynn by the defendant. . .and the suggestion made that the moose hairs in the box of the truck could have fallen from trees. Are you able to give an opinion on that?"

Dr. Fish was—and what he had to say proved important to Lynn's case. Moose hairs, he explained, are firmly rooted in the subcutaneous layer of the hide. Without very abrasive action, they would not pull free. Sauve then asked him whether the hairs could have been scraped off as the moose rubbed against tree branches. Only "by very heavy branches," Dr. Fish replied.

In further testimony, Dr. Fish said that the moose hair on the jack shirt found in the Datsun could have come off the hide during the gutting. The hair found under the driver's door could have come off his clothing afterwards.

There was little doubt that the evidence against the owner of the Datsun was circumstantial. And the most circumstantial evidence of all—but the most damning—was the little metal screw.

When Judge Michel had weighed all the evidence, he declared it consistent with the guilt of the defendant and inconsistent with any other rational conclusion.

The poacher was fined $500 and costs. ■

STOCKING BARREN WATERS